

Name: _____

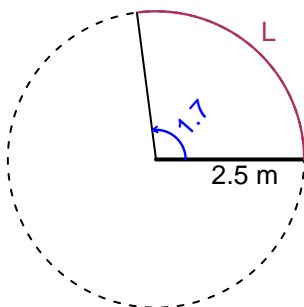
Date: _____

Trig Final (Solution v22)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.5 meters. The angle measure is 1.7 radians. How long is the arc in meters?

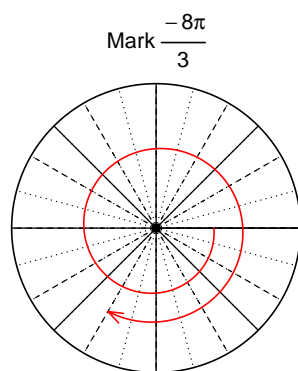


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 4.25$ meters.

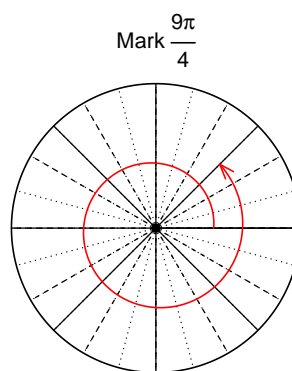
Question 2

Consider angles $-\frac{8\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{8\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-8\pi/3)$

$$\sin(-8\pi/3) = -\frac{\sqrt{3}}{2}$$



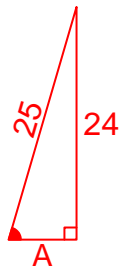
Find $\cos(9\pi/4)$

$$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\sin(\theta) = \frac{24}{25}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

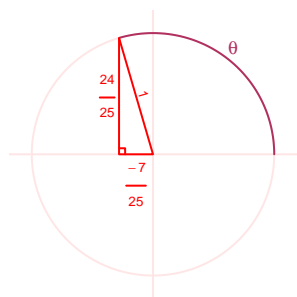
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 24^2 &= 25^2 \\A &= \sqrt{25^2 - 24^2} \\A &= 7\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-7}{25}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.94 meters, a frequency of 2.15 Hz, and a midline at $y = 3.69$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.94 \cos(2\pi 2.15t) + 3.69$$

or

$$y = 8.94 \cos(4.3\pi t) + 3.69$$

or

$$y = 8.94 \cos(13.51t) + 3.69$$